JUN 18 1990

FLOOD INSURANCE STUDY

CITY OF EVERETT, WASHINGTON
SNOHOMISH COUNTY

REVISED: SEPTEMBER 5, 1990

Federal Emergency Management Agency

COMMUNITY NUMBER - 530164

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all the data available within the repository. Please contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
CITY OF EVERETT, SNOHOMISH COUNTY, WASHINGTON

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the City of Everett, Washington. This information will be used by the City of Everett to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey (USGS) for the Federal Emergency Management Agency (FEMA), under Interagency Agreement No IAA-H-17-75, Project Order No. 8. This study, which was completed in March 1976, covered the Snohomish River and Possession Sound. Hydraulic computations for this study were performed by the U.S. Army Corps of Engineers (COE).

1.3 Coordination

A search for basic data was made at all levels of government.

Coordination of this study involved contacts with the City of Everett, the City Community Development Department, local planners, residents, the local newspaper, and the COE.

Joint meetings of the COE, USGS and FEMA were held on February 19, 1975, and April 23, 1975, to coordinate this study covering Everett with the updated Flood Insurance Study of Snohomish County done by the COE. Agreement on common discharge-frequency, tide elevation-frequency relationships, cross section data and hydraulic computations was accomplished at these meetings.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Everett. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were determined by FEMA, the USGS and the community. The Snohomish River and Possession Sound were studied in detail. It was agreed that because all of the very small creeks within the city limits are in steep narrow ravines, and none have caused or are expected to cause any flood problems, they would not be included in this study. A small marshy area west of Alverson Boulevard and east of the Burlington Northern Railroad was studied by approximate methods.

2.2 Community Description

The City of Everett, in northwestern Washington, is located 29 miles north of Seattle, in west central Snohomish County on the east shore of Possession Sound. The 1980 population of Everett was 54,413, a 1.5-percent increase from the 1970 population of 53,622 (Reference 1).

The Snohomish River drains an area of 1,780 square miles and flows into Possession Sound at Everett. The Skykomish River and Snoqualmie River join 16 miles southeast of Everett to form the Snohomish River.

Stream flow in both the Skykomish and Snoqualmie Rivers originates from snowmelt in the high mountains of the Cascade Range, and from rainfall in the foothills. The Snohomish River below the confluence of the Skykomish and Snoqualmie Rivers flows through a floodplain that is from 1 to 3 miles wide. An estuarial area of marshes, low islands and sloughs characterizes the Snohomish River in the vicinity of Everett.

The floodplain within the Everett city limits contains some residential development, but has been developed primarily for commercial and industrial use.

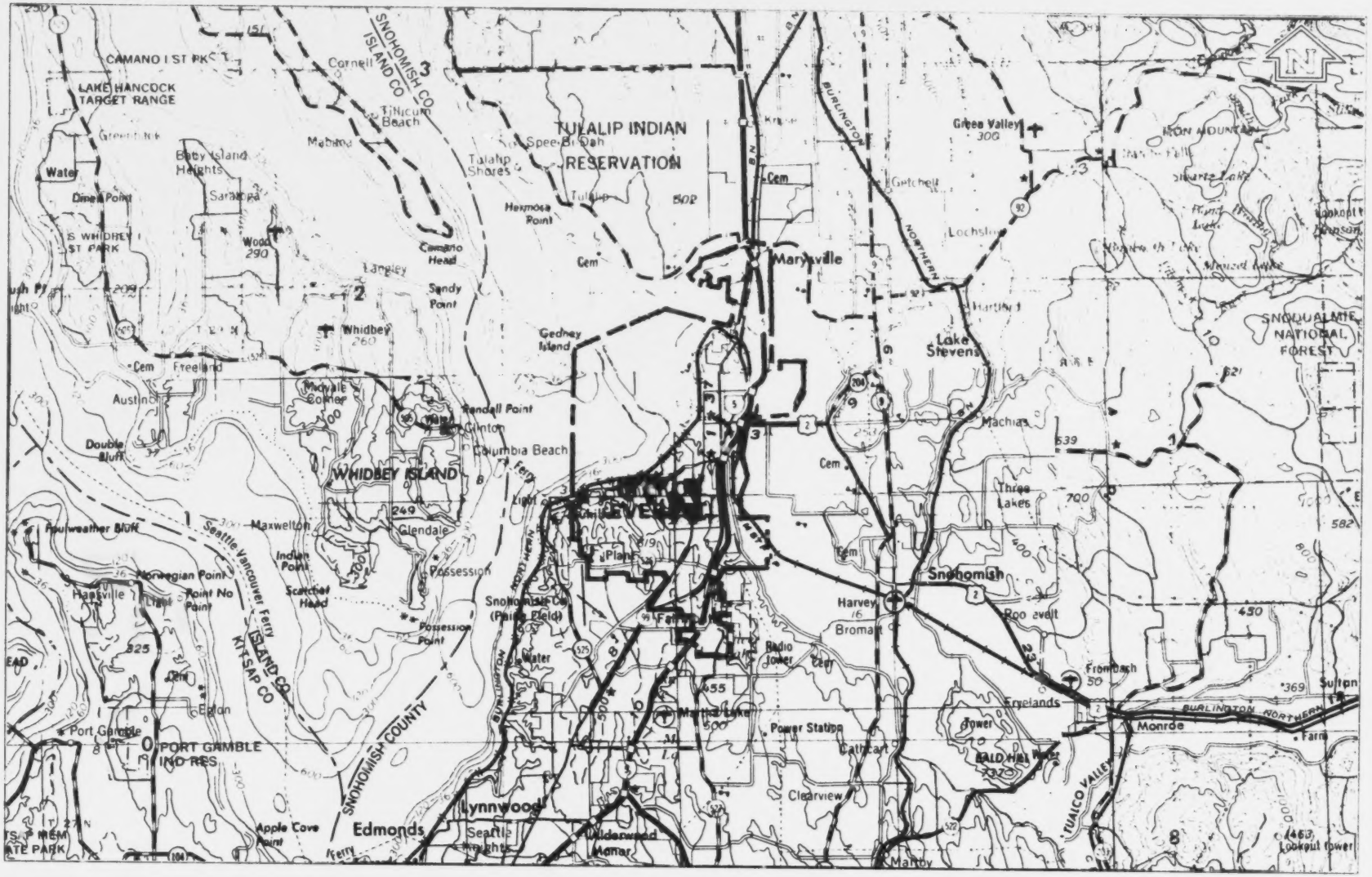

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EVERETT, WA

(SNOHOMISH CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

The topographic and climatic conditions associated with flooding in the Snohomish River Basin are typical of those found throughout the Puget Sound area. The climate, at Everett, is marine with an annual precipitation of 34.5 inches, while the headwaters for the Snohomish River basin are alpine with nearly 200 inches of precipitation. Average snowfall throughout the basin ranges from 11 inches at Everett to 600 inches in the Cascades (Reference 2).

2.3 Principal Flood Problems

Flooding of the City of Everett may occur from high tide levels in Puget Sound or from floods on the various rivers and streams in the county.

Tidal flooding can occur when a high astronomical tide (gravitational effects of the sun and moon) is heightened by a large storm surge (rise in water levels due to wind stress and low atmospheric pressure). Wave runup during high tide conditions will affect those areas where the shorelines are not sheltered from local wind effects.

Flooding generally occurs during the winter months of November through February, when storms originating over the Pacific Ocean bring intense precipitation and warm winds that melt the accumulated snowpack. These storms usually last two to three days, and river discharge at Everett may increase from low flow to flood stage within 24 to 48 hours. High stream discharges also occur during the spring runoff, which results from high elevation snowmelt. In comparison with winter floods, such discharges are characterized by large volumes of flow with relatively low crests occurring over long periods of time (1 to 2 weeks). High tides alone do not usually cause flooding, but when combined with high winds, can cause flooding along the coastline.

The Snohomish River has flooded extensively three times in the last 25 years. Flooding occurred in 1951, 1960, and 1975. In 1951, the highest of the three, the peak flow was 136,000 cubic feet per second (cfs) at Snohomish, 12 miles upstream. Tide flooding of part of the coastal industrial area has also occurred three times in the last 25 years, as reported by local residents. Coincidence of the annual highest tide level with a river peak can enlarge the extent of river flooding, but over the 30 years during which records have been kept, the magnitude of such coincident tides has not exceeded that having a 3-year recurrence interval.

The major problem associated with these floods (1951, 1960, and 1975), has been inundation of the low-lying agricultural lands, resulting in loss of crops and in some cases failure of dikes and blocked roads.

Scenes of the 1975 flood on the Snohomish River are shown in Figures 2 and 3. Scenes of tidal flooding in January 1974, are shown in Figure 4.

2.4 Flood Protection Measures

Existing flood control measures, within the Snohomish River Basin, consist of two small upstream storage reservoirs, floodplain levees and channel improvements. Channel improvements, within the study area, consist of dredging and bank protection. Levees constructed along the lower reaches of the river also protect the waterfront industries against the high tides of Puget Sound, except during extreme river floods. Existing levees of the Marshland Control District provide protection along the left bank of the Snohomish River (River Mile 9 to River Mile 17.6) from a flood of about 63,000 cfs, which has been exceeded at least once annually in 33 percent of the years during which records have been kept, or once on the average in every 3 years (Reference 3). This project provides limited flood protection within the upper reaches of the study.

Due to the flat stream gradient (1 foot per mile) and river basin runoff characteristics, the lower Snohomish River Valley is subject to a zero damage flow or more, at an average of twice each year. Zero damage flow is defined as: "the maximum flow a stream can carry without causing overbank flow and damages" (Reference 4). Because of this, Snohomish County implemented land use controls and floodplain regulations in 1968.

A 2.3 mile long jetty (breakwater) and Jetty Island affords protection to the Port of Everett and the coastal industrial area from medium tides. This island is periodically raised but at present would be overtopped by the 100-year tide.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals

Figure 2. Snohomish River flooding, looking east toward railroad yard at Lowell Street, December 2, 1975

Figure 3. Snohomish River flooding, looking west, 36th Street on left, December 2, 1975

Figure 4. Tidal flooding, Port of Everett, January 14, 1974

or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10); for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for the Snohomish River and the maximum elevation-frequency relationships for tides of the selected recurrence intervals for the Port Gardner waterway.

The Snohomish River discharge-frequency relationship for the City of Everett Flood Insurance Study (October 1977, Reference 5) was based on statistical analyses of 23 years of record (1942-1965) at the "Snohomish River at Snohomish" gage. In 1973, when the analyses were completed, it was believed that this record represented existing Snohomish River conditions; however, the December 1975 flood indicated a discrepancy between the Monroe and Snohomish gage readings. Further analyses of the 1975 flood and other floods led to the conclusion that levee construction after the 1959 floods had increased the bankfull capacity upstream from the Snohomish gage from approximately 60,000 cfs to approximately 125,000 cfs. The higher levees restrict overflow into the Marshland and French Creek areas, which reduces the attenuating effect of valley storage, leading to higher peak discharges. Since the Snohomish gage record does not reflect present overflow conditions, it was decided to use the gage record at Monroe, which is upstream from the Snohomish gage and not as affected by the changed valley storage conditions downstream. A discharge-frequency curve was developed for the Monroe gage by the statistical analyses of both observed (1964 to the present) and computed (1930-1963) peak discharges. The frequency statistics were adjusted for historical peak discharges occurring in 1897, 1906, 1918 and 1921 to increase the effective period of the data base to over 80 years.

The discharge frequencies at Snohomish were determined by routing hypothetical floods from Monroe using an unsteady flow model to reflect the changed floodplain conditions. As a result of this analysis, the 100-year flood discharge at Everett increased from 144,000 cfs to 170,000 cfs, which resulted in a stage increase from 17.7 feet to 20.0 feet. Although the increase is primarily due to the changed flow conditions, some of the increase is primarily due to the changed flow conditions, some of the increase is probably due to the extended base period developed for the Monroe gage.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of the Snohomish River are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
Snohomish River At Snohomish	1,729	125,000	141,000	174,000	243,000
At Everett	--[1]	--[1]	--[1]	170,000	--[1]

[1] Not Available

The Summary Of Stillwater Elevations table (Table 2) was developed using 76 years of annual Peak tides as recorded at the Seattle Tidal Station (Reference 6), and analyzed using the log-Pearson Type III method, with +0.2 skew. These values were then transferred to Everett using tide prediction tables (Reference 7). Wave runup was determined by comparing the high water mark elevations of two storms against the record high-tide levels as transferred from Seattle.

TABLE 2 - SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
Possession Sound	7.9	8.3	8.4	8.7

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of Snohomish River were made to provide estimates of the elevations of floods of the selected recurrence intervals, for the areas studied by detailed methods.

Flood elevations for the lower Snohomish River were calculated using the multiple junction unsteady flow model that simulates complex unsteady flow conditions using a hydraulic routing procedure based on the St. Venant equations, the basic differential equations of unsteady flow. The program requires time-dependent input of stage or discharge at the outer model boundaries to calculate the resultant stage, discharge, and velocity hydrographs at the interior computational nodes. For the Snohomish River, the 100-year flood profile developed by the "unsteady state" method was used to calibrate a step-backwater model that was used to calculate the floodway profile. The backwater model was also calibrated to the 1975 flood as described below.

For flood profile calculations, channel and overbank roughness factors (Manning's "n") were initially based on empirical methods, then adjusted as necessary during model calibration. Field inspections and photographs aided the "n" value determination. Roughness values for all flooding sources varied from 0.020 to 0.067 for the channel and from 0.04 to 0.15 for the overbank areas.

The numerical model for the reach of the Snohomish River from RM 0.0 to RM 20.5 was calibrated to within approximately 0.8 foot for 93 percent of the observed water-surface elevations of the December 4, 1975, flood (126,000 cfs at mouth, 20-year recurrence interval).

The starting water-surface elevations for the Snohomish River were based on mean higher high-tide elevations of 5.0 feet.

Flood profiles for the Snohomish River were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1). Table 3 presents the final elevations of the various recurrence intervals along the shoreline of Everett between the mouth of the Snohomish River and the City of Everett corporate limits to the south. The effects of wave runup due to wave action on the final elevations were determined using an elevation frequency curve developed for Possession Sound (see Table 2) and adding the contribution of wave runup, determined from high water marks which were obtained for storm events on January 14, 1974, and December 4, 1975. The wave runup values were then added to the values presented in Table 2. The variation of the elevation along the shoreline, south of the mouth of the Snohomish River is due to the existence of a 2.3 mile-long jetty which runs parallel to the shoreline of Everett and provides some protection from wave action.

TABLE 3 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet) 10-YEAR[1]	50-YEAR[1]	100-YEAR[1]	500-YEAR[1]
Possession Sound/Port Gardener				
At the mouth of Snohomish River and U.S. Interstate 99	7.9	8.4	8.5	8.8
At the intersection of Everett Avenue and West Marine View Drive	7.9	8.2	8.4	8.7
Approximately 400 feet north of the intersection of North Park Drive and Olympic Boulevard	8.0	8.4	8.5	8.8
At the Corporate limits of the City of Everett	8.3	8.6	8.8	9.0

[1] Includes Effects of Wave Runup

For the area determined by approximate methods, historical references were used to delineate the flooding. The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if

hydraulic structures remain unobstructed, operate properly, and do not fail. All elevations are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. A local datum in use in the city is the "City of Everett" datum. To convert from NGVD to City of Everett datum, add 99.02 feet. Elevation reference marks used in this study are shown on the maps; the description of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied by detailed methods, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic using topographic maps at a scale of 1:4,800, with a contour interval of 5 feet (Reference 8).

The coastal boundaries were delineated on the same maps using the elevations listed in Table 3.

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE); and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

For the area determined by approximate methods, the boundaries were delineated using historical references.

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced.

The floodway developed for the October 1977 FIS for Everett (Reference 5) was selected from four alternative floodways, whose boundaries were arbitrarily selected by the COE, Seattle District in April 1975 (Reference 9). A Snohomish River floodway from RM 0.0 to RM 16.62 was originally selected by the Snohomish County Planning Commission with assistance from the technical staff of Everett and Marysville, after considering each of the alternative floodway configurations. Snohomish County later withdrew the floodway when anticipated changes to the State Flood Control Zone Act were not made. Snohomish County committed to regulate the lower Snohomish Valley by other methods that do not require a floodway. Therefore, in order to maintain consistency with the Snohomish County FIS no floodway has been designated along the Snohomish River within the City of Everett.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains, floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

Two previous reports by the COE (References 10 and 11) cover the Snohomish River Valley, a previous FIS for the City of Everett was published in October 1977 (Reference 5).

This study is authoritative for purposes of the NFIP and the data presented here either supersede or are compatible with previous determinations.

This study agrees with the Flood Insurance Study for Snohomish County, Washington, dated September 15, 1983 (Reference 12), except for the coastal flooding zone designations.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, SW., Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

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6. National Oceanic and Atmospheric Administration, written communication, 1975.

7. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Tide Tables West Coast of North and South America, National Ocean Survey, 1975.

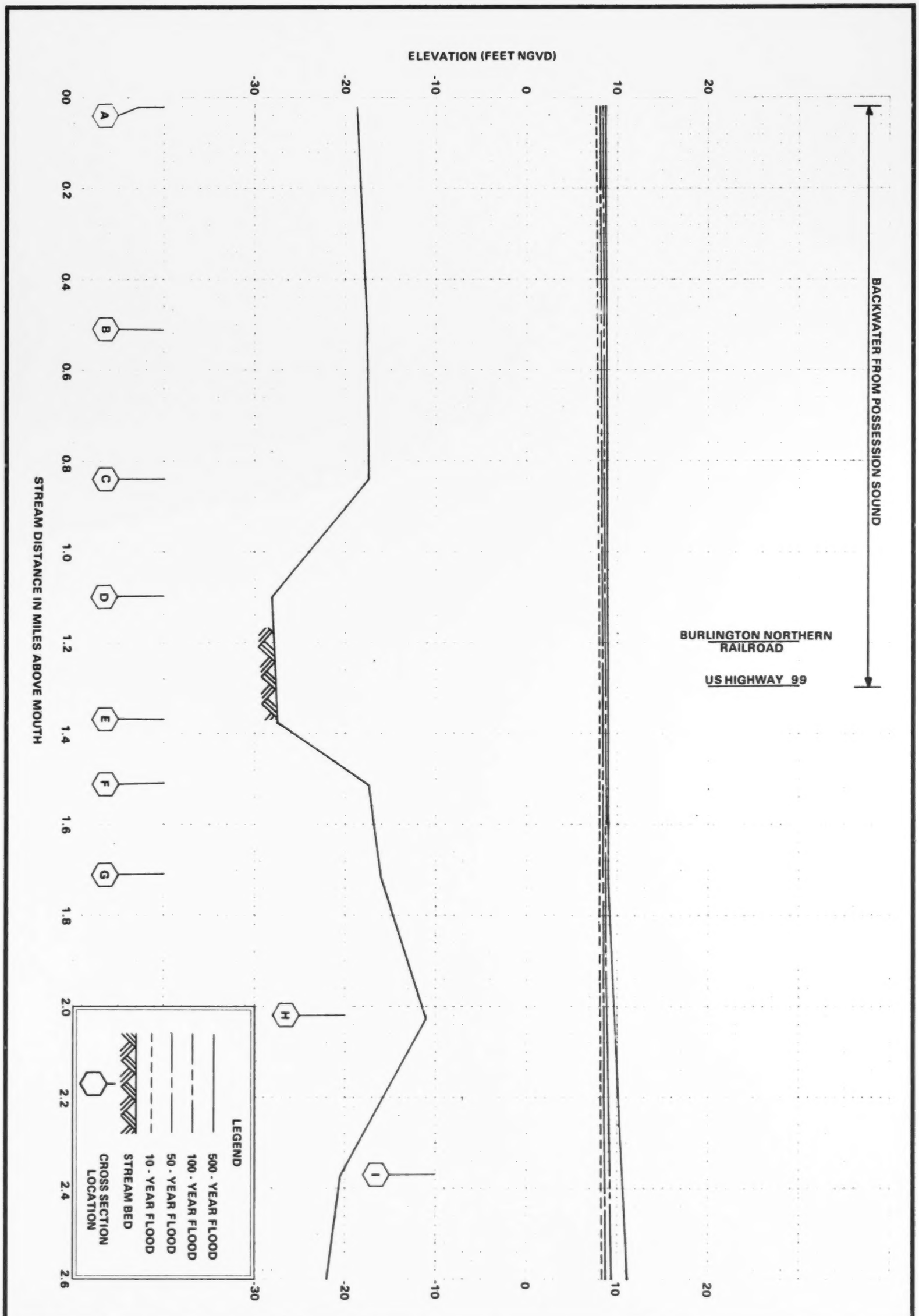
8. U.S. Army Corps of Engineers, Seattle District, Work Map for Flood Insurance Study, Snohomish River and Tributaries, Scale 1:4,800, District File No. E-2-6-467, September 1981.

9. U.S. Department of the Army, Corp of Engineers, "Special Study, Suggested Hydraulic Floodways, Snohomish River - Vicinity of Snohomish to Everett, Snohomish County, Washington," April 1975.

10. U.S. Army Corps of Engineers, Flood Plain Information Study Snohomish River Basin, Washington, 1967.

11. U.S. Army Corps of Engineers, Flood Insurance Study, Unincorporated Area, Snohomish County, Washington, 1971.

12. Federal Emergency Management Agency, Flood Insurance Study for Snohomish County, Washington, Unincorporated Areas, September 15, 1983.



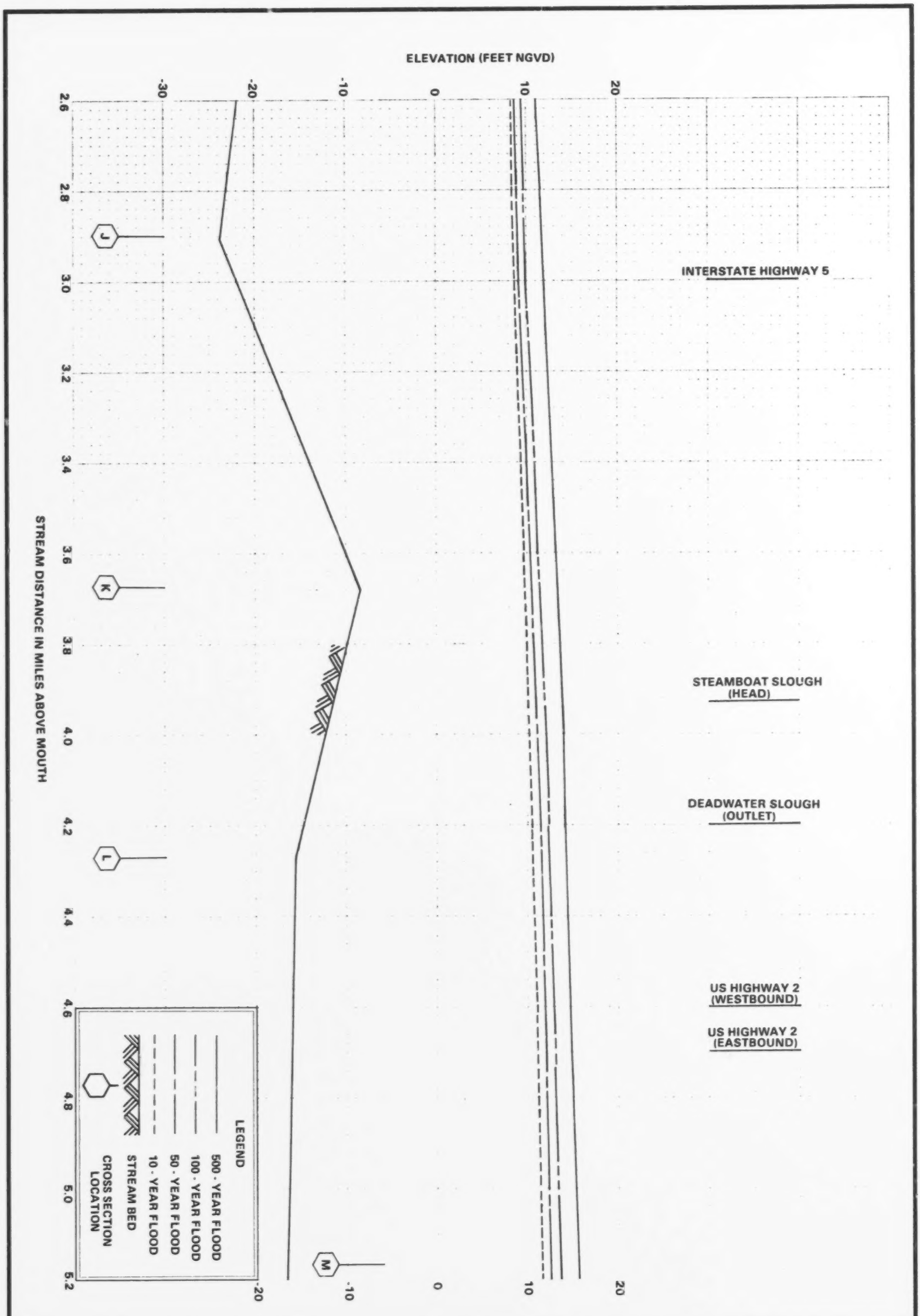
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EVERETT, WA.
(SNOHOMISH COUNTY)

01P

FLOOD PROFILES

SNOHOMISH RIVER



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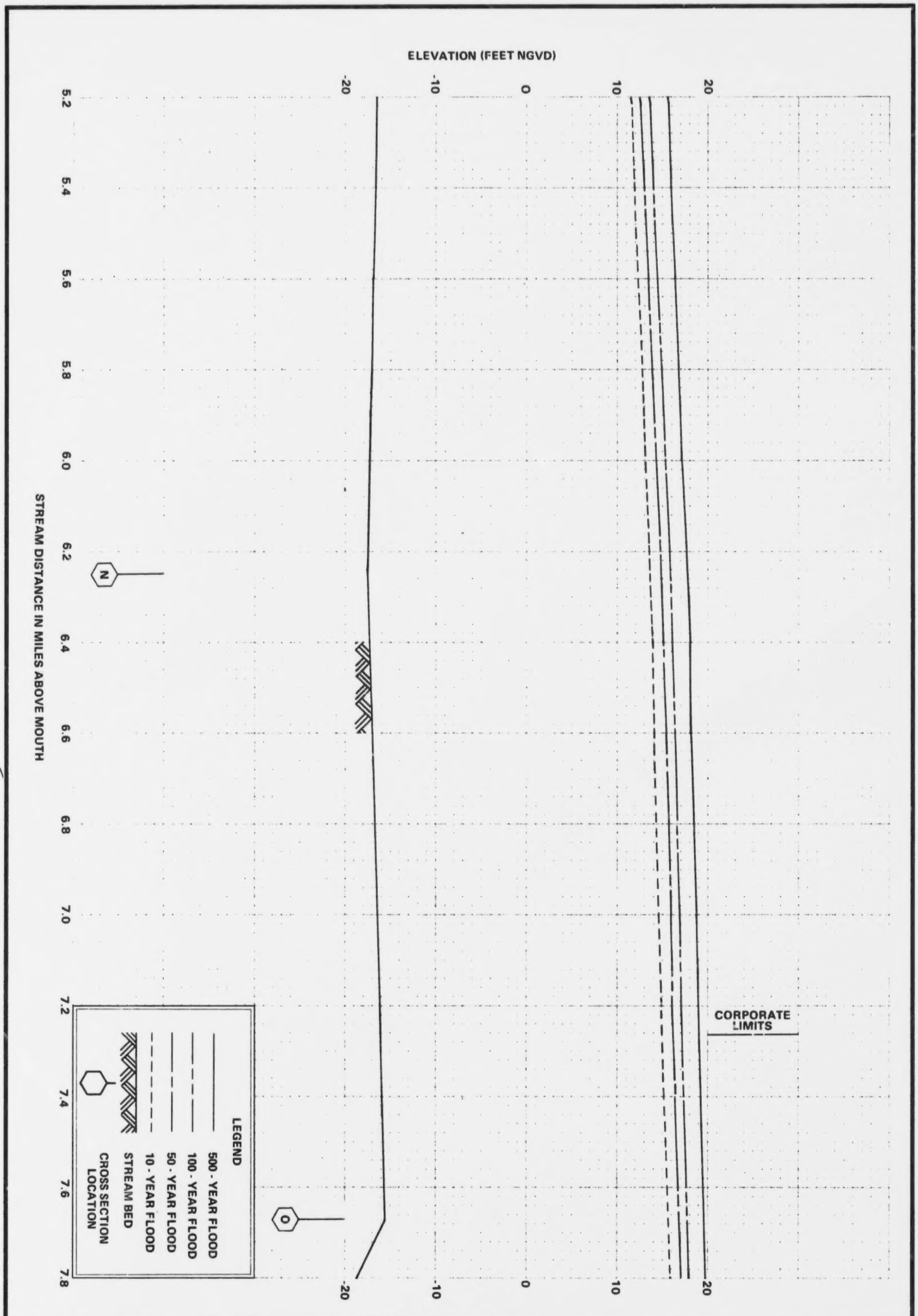
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EVERETT, WA.
(SNOHOMISH COUNTY)

FLOOD PROFILES

SNOHOMISH RIVER



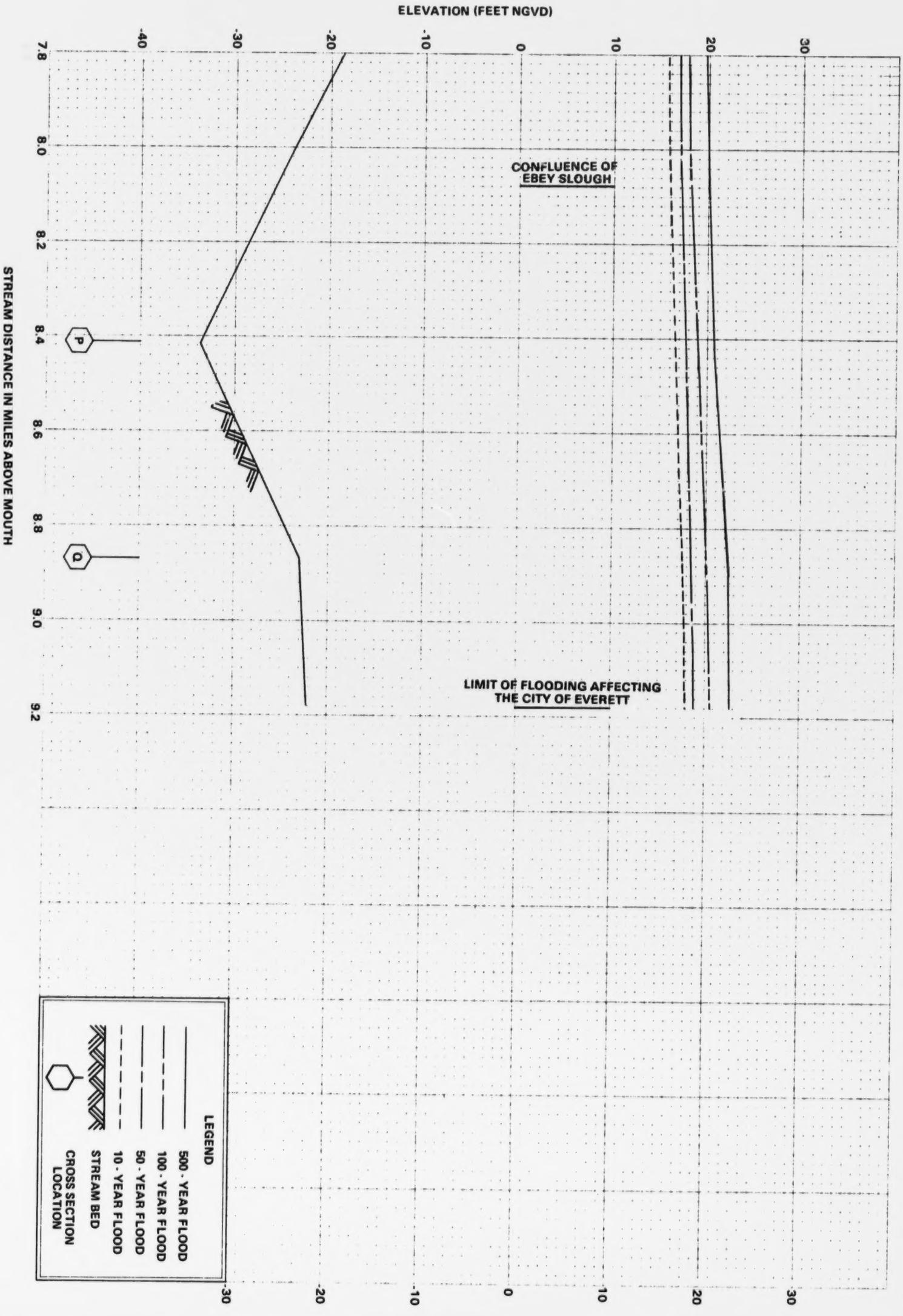
03P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EVERETT, WA.
(SNOHOMISH COUNTY)

FLOOD PROFILES

SNOHOMISH RIVER



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04P

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF EVERETT, WA.
(SNOHOMISH COUNTY)

FLOOD PROFILES

SNOHOMISH RIVER

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Reference Mark	Elevation (feet NGVD)	Description of Location
RM 1	15.497	In Everett, 1.8 miles south of railway station in Everett, in granite block on top of seawall that parallels railway tracks, 289 feet north northeast of semaphore 314, and 9 feet south of switch stand on west track, standard tablet stamped "7 1935."
RM 2	13.997	In Everett, 0.3 mile southwest of railway station in Everett, 0.5 mile southwest of Hewitt Avenue and 100 yards from waterfront in Weyerhauser Paper Mill foundation. It is 26 feet west of west rail of lower tracks between two steel doors on southeast side and near east corner 10 inches above ground; standard tablet stamped "No 9 1952."
RM 3	17.444	In Everett, set in top of lowest step at northwest end of northeast abutment of railroad bridge over Wall Street; 2.5 feet above sidewalk, about 150 yards southwest of southwest end of passenger station and about 15 feet below track; stamped "5 1934."
RM 4	23.107	In Everett, at Hewitt Avenue overhead railroad bridge, 100 yards northeast of northeast end of railway station, in top of northwest corner of west stone pier supporting steel column on south curb line of Hewitt Avenue, about 18 inches higher than concrete side walk, 16 feet north of face of high retaining wall at southwest end of underpass; standard tablet stamped "J7 Elev. 23.025 ft."

NOTE: Add 99.02 feet for City of Everett Datum.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (Cont'd)

Reference Mark	Elevation (feet NGVD)	Description of Location
RM 5	17.093	In Everett, 0.7 mile north along railway from station at Everett, at highway bridge overpassing railroad set in the top of the east corner of the concrete base of the southwest one of four steel piers, 27.4 feet southwest of centerline of the bridge and about 1.0 foot above the track; standard tablet stamped "Q 296 1947."
RM 6	12.76	In Everett, lag bolt in power pole "2/2" on east side of Norton Avenue across from Cruise A Home Manufacturing Company Fire Alarm Box No. 2237 on this pole.
RM 7	13.23	In Everett, railroad spike in power pole "1/15" on east side of Norton Avenue approximately 700 feet south of RM 8.
RM 8	13.03	In Everett, railroad spike in power pole "1/13" on east side of Norton Avenue south end of Port Gardner Bay North View Park.
RM 9	10.62	In Everett, railroad spike in west side of power pole "WN 1/4" located on east side of Norton Avenue approximately 150 feet south of south end of Norton Avenue bridge, and 40 feet north of Burlington Northern railroad switch 351.
RM 10	18.054	In Everett, 1.8 miles north along railway from passenger station at Everett, set vertically in concrete support column of road overpass 4.5 feet above ground; standard tablet stamped "N 457 1973."
RM 11	13.22	In Delta Junction, top of upright bolt in base or railway block signal, southwest of spur line tracks to Weyerhauser Company, each of U.S. Highway 99, northeast of bolts in base painted red.

NOTE: Add 99.02 feet for City of Everett Datum.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (Cont'd)

Reference Mark	Elevation (feet NGVD)	Description of Location
RM 19	16.36	In Lowell, railroad spike in power pole intersection of Larimer Road and private drive (6526 Larimer Road). Power pole no. "H9"
RM 20	21.80	In Lowell, top of bolt head in fire hydrant across road from 6613 Larimer Road.
RM 21	19.87	In Lowell, southwest corner of concrete slab for front porch of brick house at 6613 Larimer Road.
RM 22	16.67	In Lowell, railroad spike in northeast side of power pole support pole on east side of Larimer Road across from power pole "H 15."
RM 23	21.14	In Lowell, lag bolt driven horizontally into southwest end of bridge checking of bridge at Railroad Yard Limit.
RM 24*	22.809	2.3 miles south along railroad from Lowell at steel bridge no. 461 in the top of east concrete abutment, 6 feet south of the track; standard tablet stamped "R59 Reset 1969."

NOTE: Add 99.02 feet for City of Everett Datum.

*Outside corporate limits.

EXHIBIT 3 - ELEVATION REFERENCE MARKS (Cont'd)

Reference Mark	Elevation (feet NGVD)	Description of Location
RM 12	11.50	In Everett, lag bolt in power pole (M-20 18) on each side of railroad and south side of road in front of boat building company, about 2 feet above ground.
RM 13	11.46	In Everett, lag bolt set vertically in concrete platform in front of Everett City Water Department pump house, 50 feet upstream from State Highway 2 westbound crossing and at left bank of channel.
RM 14	13.72	In Everett, a bolt set 3 feet above the ground on the south face of the most southerly pillar, of the second pier west of the west end of the steel bridge over the Snohomish River on State Highway 2 eastbound.
RM 15	13.117	In Everett, 2.3 miles south of railway station in Everett, in granite block on top of seawall that parallels railway tracks, 2 feet north of end of seawall; standard tablet stamped "8 1935."
RM 16	15.34	In Lowell, top of nut on west side of power pole about 3.5 feet above ground, east of railroad track and on north side of road at crossing, just south of Railroad Belt Yard sign.
RM 17	20.99	In Lowell, top of northeast bolt in base of railroad signal at Lowell Junction, on west side of tracks opposite of abandoned building and marked red.
RM 18	20.88	In Lowell, lag bolt in power pole on east side of railroad tracks and north side of road at crossing and in west side of pole at about road elevation.

NOTE: Add 99.02 feet for City of Everett Datum.